

## The Federal Funds and Long-Term Rates

The Federal Open Market Committee (FOMC) increased its target for the federal funds rate from 1.0 percent in late June 2004 to 5.25 percent (as of February 2007) in a series of 17 consecutive 25-basis-point adjustments. But this rise in the funds rate is not reflected in long-term yields: The 10-year Treasury yield averaged 4.73 percent in June 2004 and 4.72 percent in February 2007. It is widely accepted that the absence of a change in long-term yields alongside a large change in the funds rate marks a break in the historical relationship between these rates and has been referred to as a “conundrum.” I argue that the break in this relationship between long-term and short-term rates may have occurred in the early 1990s.

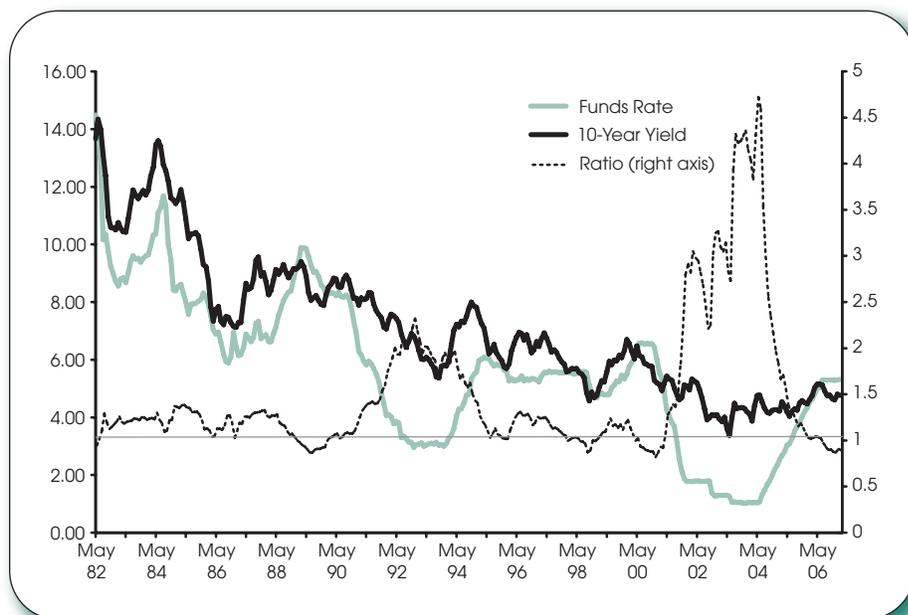
It is well known that over sufficiently long periods of time long-term and short-term rates move together. The attached chart shows this by plotting the effective federal funds rate, the 10-year Treasury yield, and the ratio of the 10-year yield to the federal funds rate from May 1982 to February 2007. The ratio is close to 1.0 at the beginning and end of the period, after both rates had declined by about 900 basis points. From May 1982 to late 1990 the funds rate and the 10-year yield moved relatively closely together, and the ratio deviated relatively little from 1.0 despite relatively large swings in rates. As rates continued to fall in the early 1990s (the funds rate declined more than the 10-year yield), the ratio increased to a peak of nearly 2.32 in December 1992. Moreover, the deviation of the ratio from 1.0 was very persistent, with the ratio remaining above the previous peak from the May 1991–January 1995 sample period. The ratio began increasing dramatically in early 2001, reaching a peak of 4.59 by June 2004 before falling back to 1.0; during this time, the FOMC was increasing its target federal funds rate relative to an essentially unchanged 10-year yield.

Larger and more persistent departures of the ratio from 1.0 since the early 1990s, despite the less-variable long-term yield, suggest that the recent conundrum may be a dramatic example of a fundamental

change in the relationship between the federal funds rate and the 10-year yield that occurred in the early 1990s.

This interpretation is supported by regressing monthly changes in the 10-year yield on monthly changes in the funds rate. When the equation is estimated using monthly data over the May 1982–December 1990 period, the estimated slope coefficient is 0.41 (indicating that, on average, a 100-basis-point change in the funds rate would be associated with a 41-basis-point change in the 10-year yield) and is highly statistically significant, with a *t*-statistic of 5.46. Moreover, the adjusted R-squared ( $\bar{R}^2$ ) is 22 percent, indicating that 22 percent of the monthly variation in the 10-year yield is accounted for by the funds rate. However, when estimated over the January 1991–June 2004 period, the estimated slope coefficient declines to 0.14 and is not statistically significant. Indeed, the estimated  $\bar{R}^2$  indicates that the funds rate accounts for less than 1 percent of the monthly variation in the 10-year yield over this period. The results are not appreciably different when the equation is estimated over the July 2004–February 2007 period. Furthermore, the results are qualitatively the same if quarterly data are used. The reason for this marked change in the behavior of these rates is a topic for further research.

—Daniel L. Thornton



Views expressed do not necessarily reflect official positions of the Federal Reserve System.

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## Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.
2. Shaded areas indicate recessions, as determined by the National Bureau of Economic Research.
3. *Percent change at an annual rate* is the simple, not compounded, monthly percent change multiplied by 12. For example, using consecutive months, the percent change at an annual rate in  $x$  between month  $t-1$  and the current month  $t$  is:  $[(x_t/x_{t-1})-1] \times 1200$ . Note that this differs from *National Economic Trends*. In that publication, monthly percent changes are compounded and expressed as annual growth rates.
4. The *percent change from year ago* refers to the percent change from the same period in the previous year. For example, the percent change from year ago in  $x$  between month  $t-12$  and the current month  $t$  is:  $[(x_t/x_{t-12})-1] \times 100$ .

We welcome your comments addressed to:

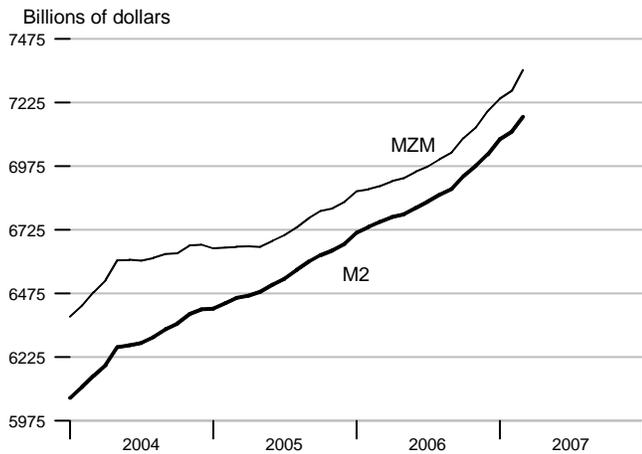
Editor, *Monetary Trends*  
Research Division  
Federal Reserve Bank of St. Louis  
P.O. Box 442  
St. Louis, MO 63166-0442

On March 23, 2006, the Board of Governors of the Federal Reserve System ceased the publication of the M3 monetary aggregate. It also ceased publishing the following components: large-denomination time deposits, RPs, and eurodollars.

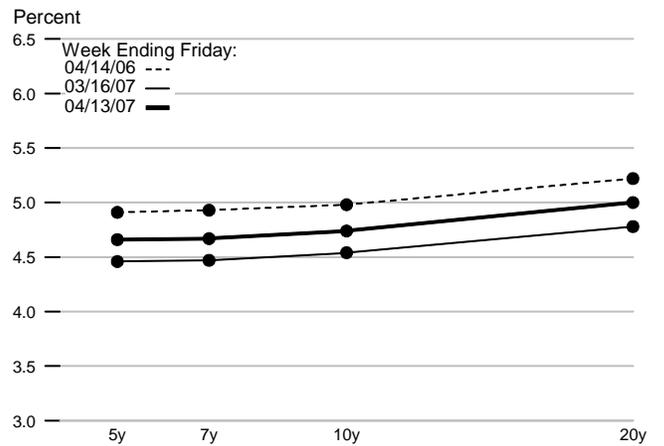
or to:

stlsFRED@stls.frb.org

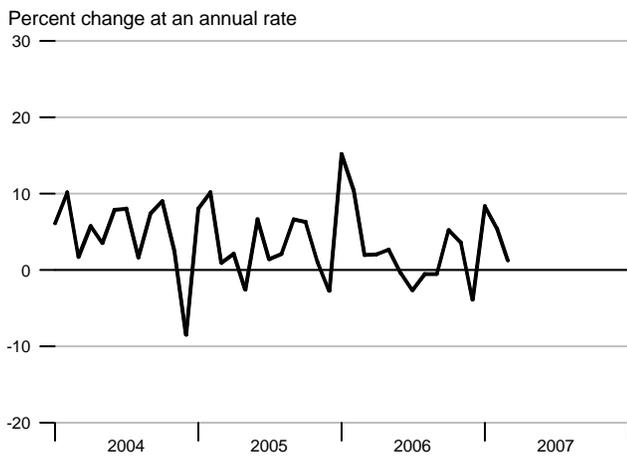
### M2 and MZM



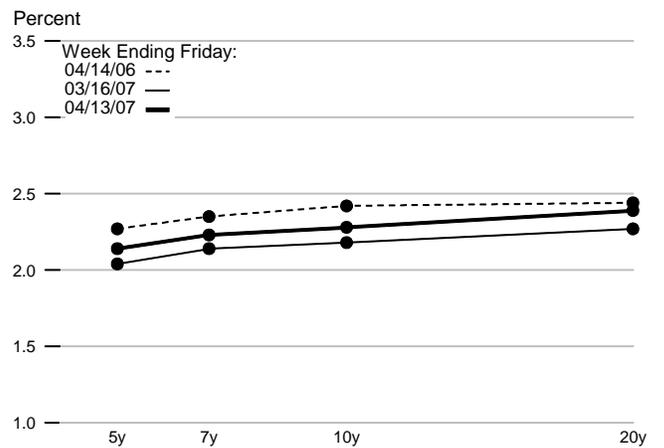
### Treasury Yield Curve



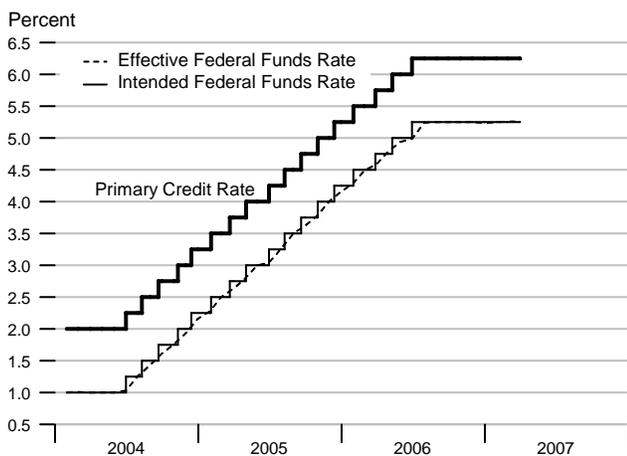
### Adjusted Monetary Base



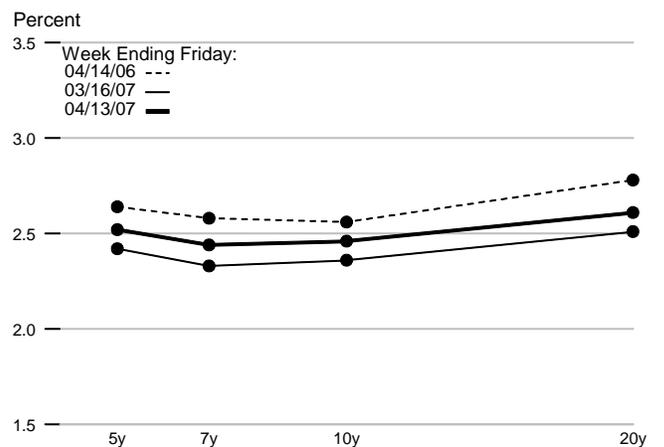
### Real Treasury Yield Curve



### Reserve Market Rates

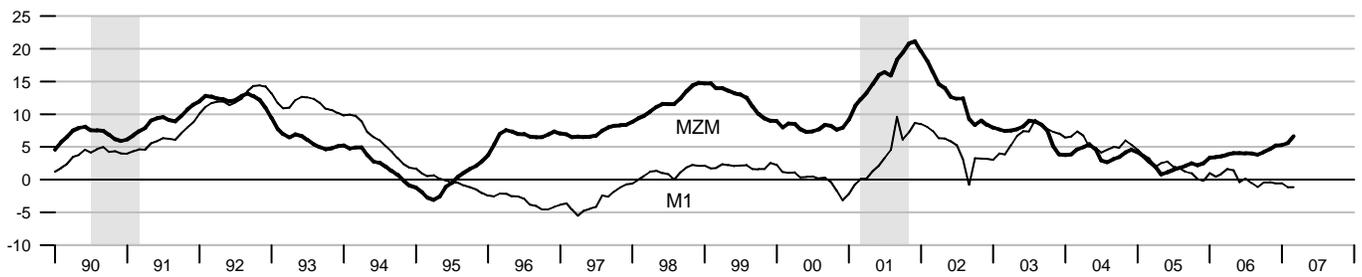


### Inflation-Indexed Treasury Yield Spreads



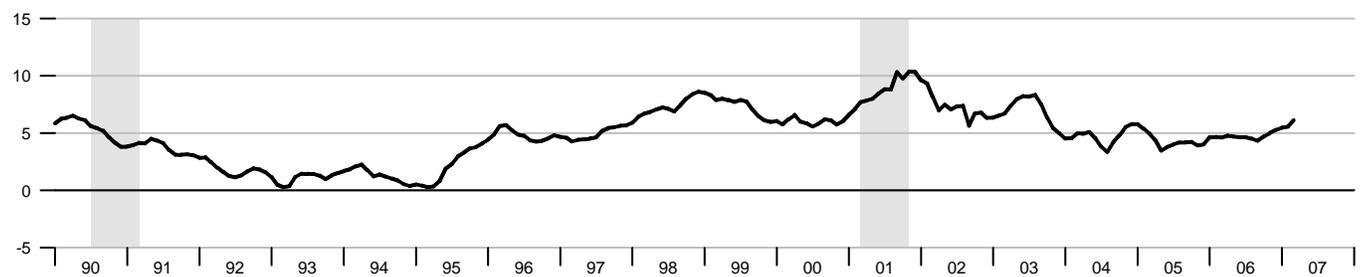
**MZM and M1**

Percent change from year ago



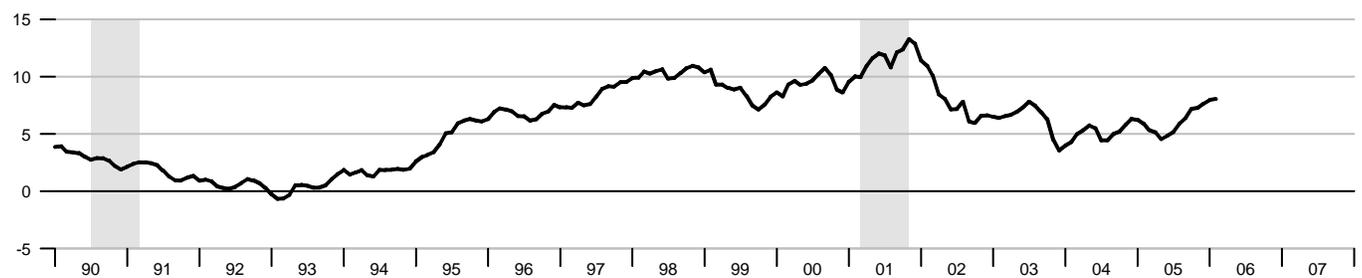
**M2**

Percent change from year ago



**M3\***

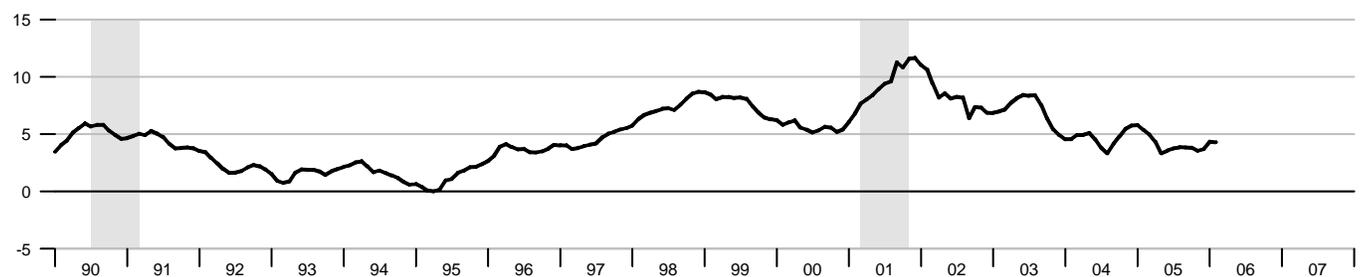
Percent change from year ago



\*See table of contents for changes to the series.

**Monetary Services Index - M2\*\***

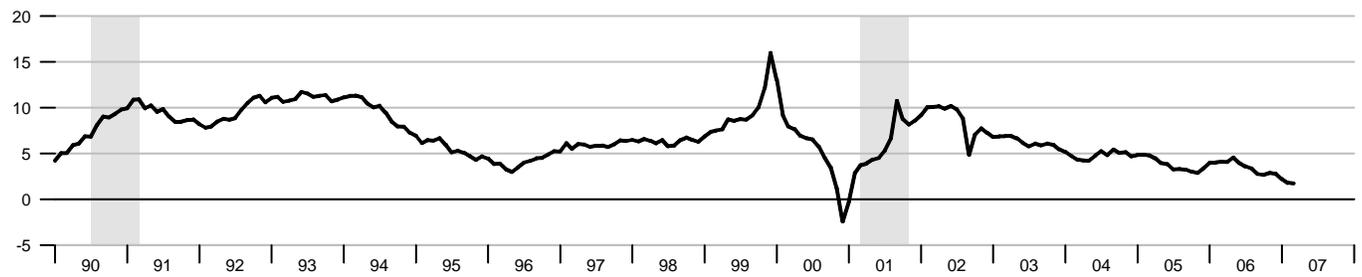
Percent change from year ago



\*\*We will not update the MSI series until we revise the code to accommodate the discontinuation of M3.

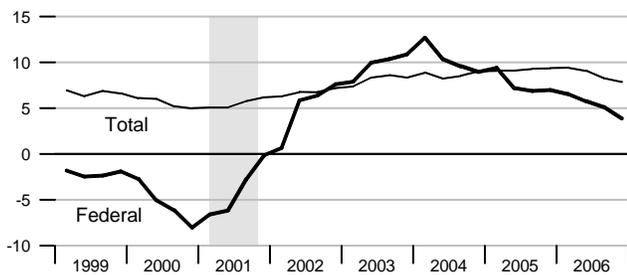
### Adjusted Monetary Base

Percent change from year ago



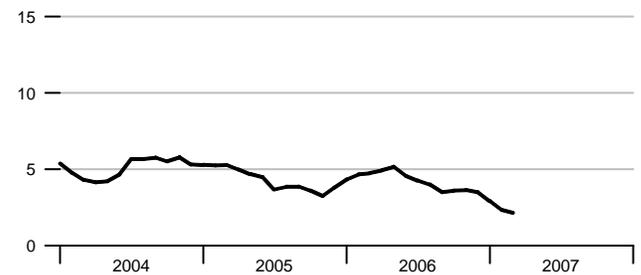
### Domestic Nonfinancial Debt

Percent change from year ago



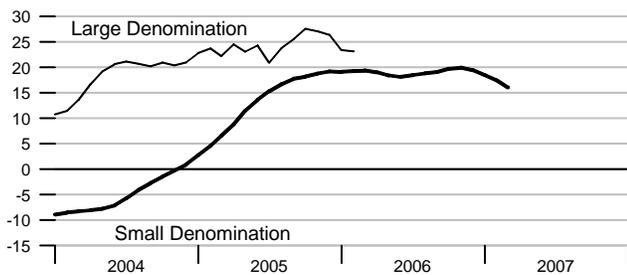
### Currency Held by the Nonbank Public

Percent change from year ago



### Time Deposits\*

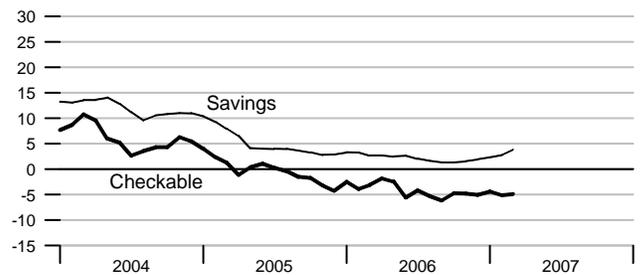
Percent change from year ago



\*See table of contents for changes to the series.

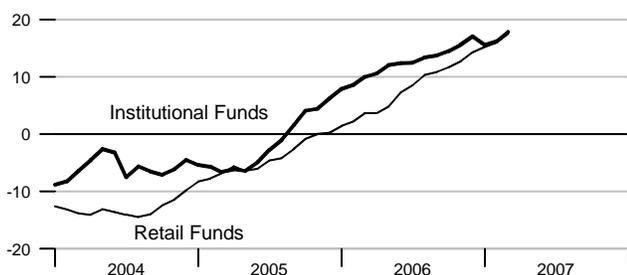
### Checkable and Savings Deposits

Percent change from year ago



### Money Market Mutual Fund Shares

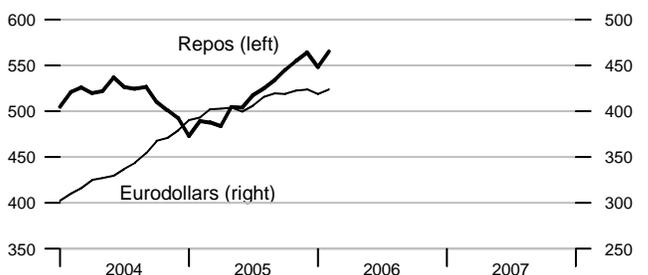
Percent change from year ago



### Repurchase Agreements and Eurodollars\*

Billions of dollars

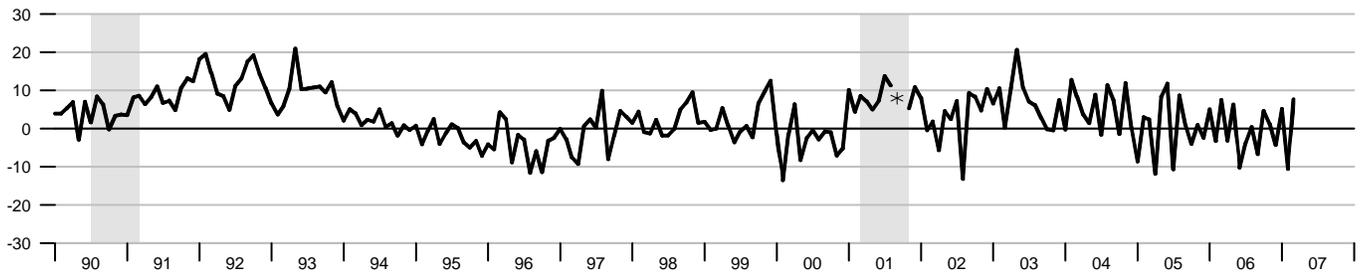
Billions of dollars



\*See table of contents for changes to these series.

**M1**

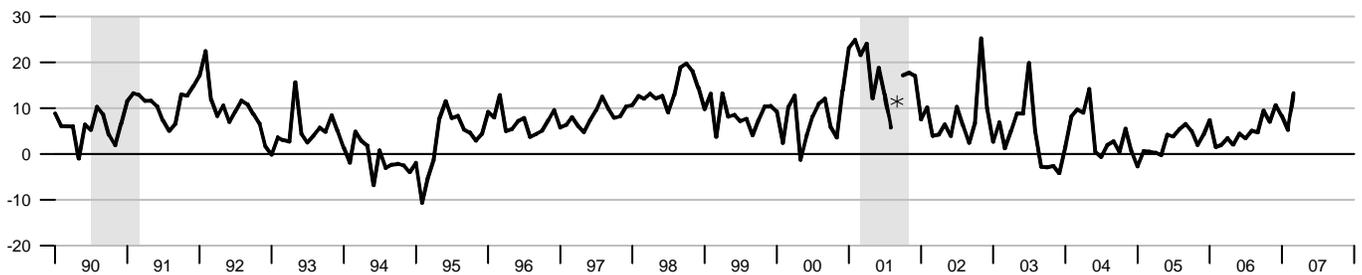
Percent change at an annual rate



\*Actual values for September and October 2001 are 55.87 and -38.35 percent rate, respectively.

**MZM**

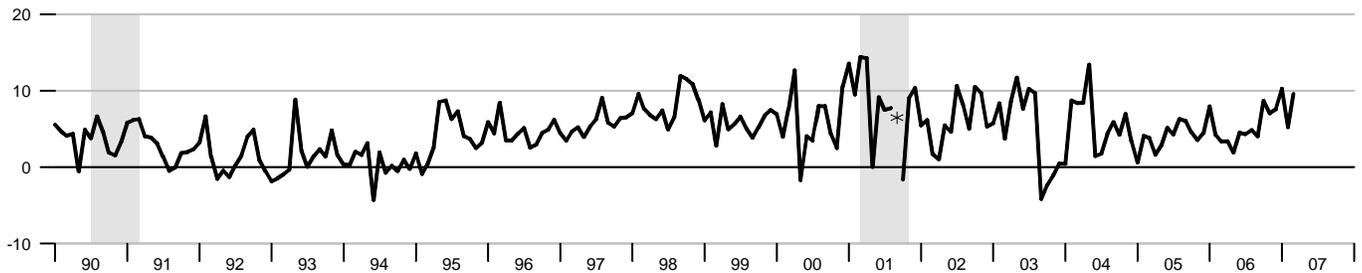
Percent change at an annual rate



\*Actual value for September 2001 is 39.41 percent rate.

**M2**

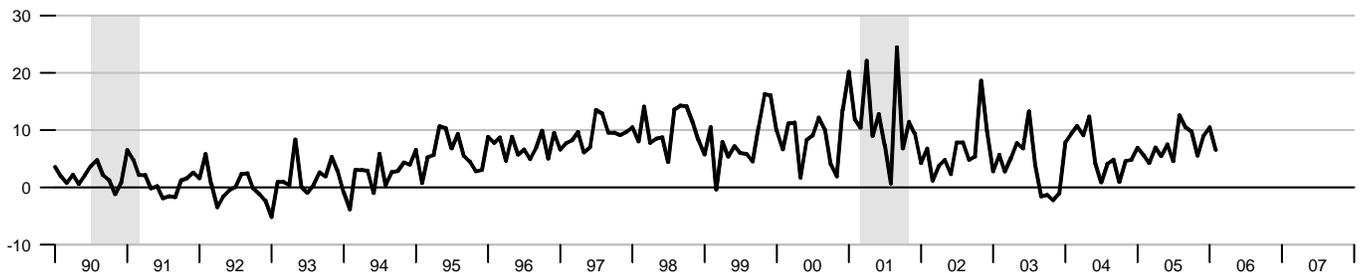
Percent change at an annual rate



\*Actual value for September 2001 is 24.90 percent rate.

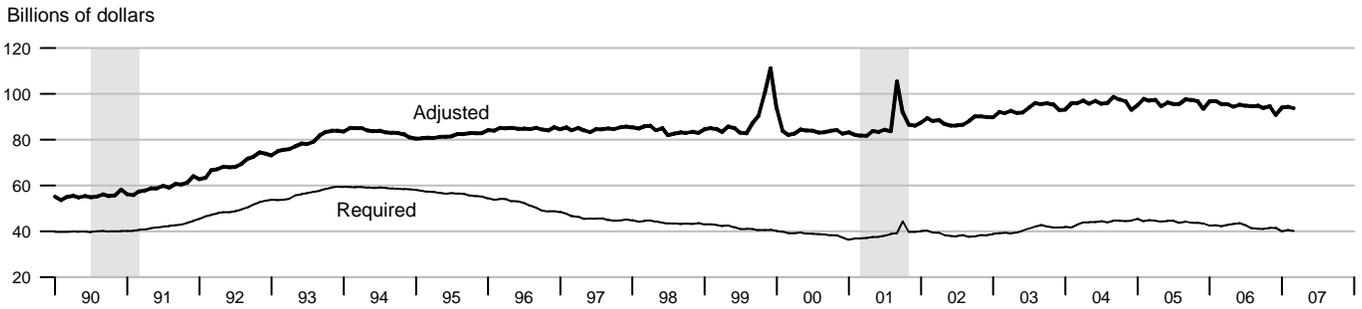
**M3\***

Percent change at an annual rate

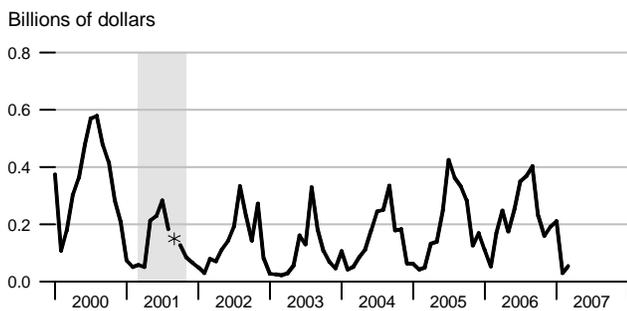


\*See table of contents for changes to the series.

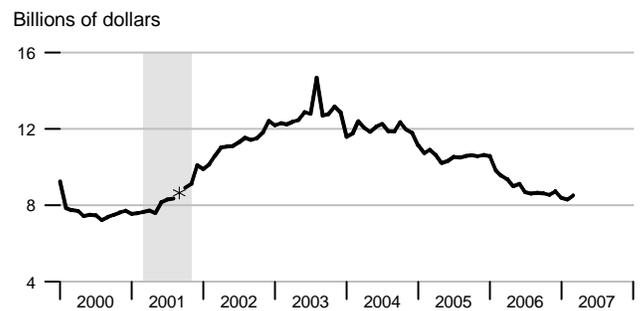
### Adjusted and Required Reserves



### Total Borrowings, nsa



### Excess Reserves plus RCB Contracts

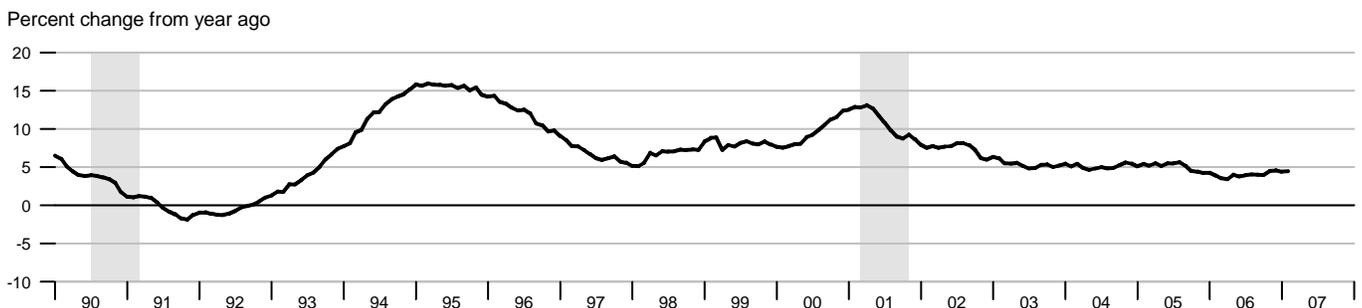


### Nonfinancial Commercial Paper

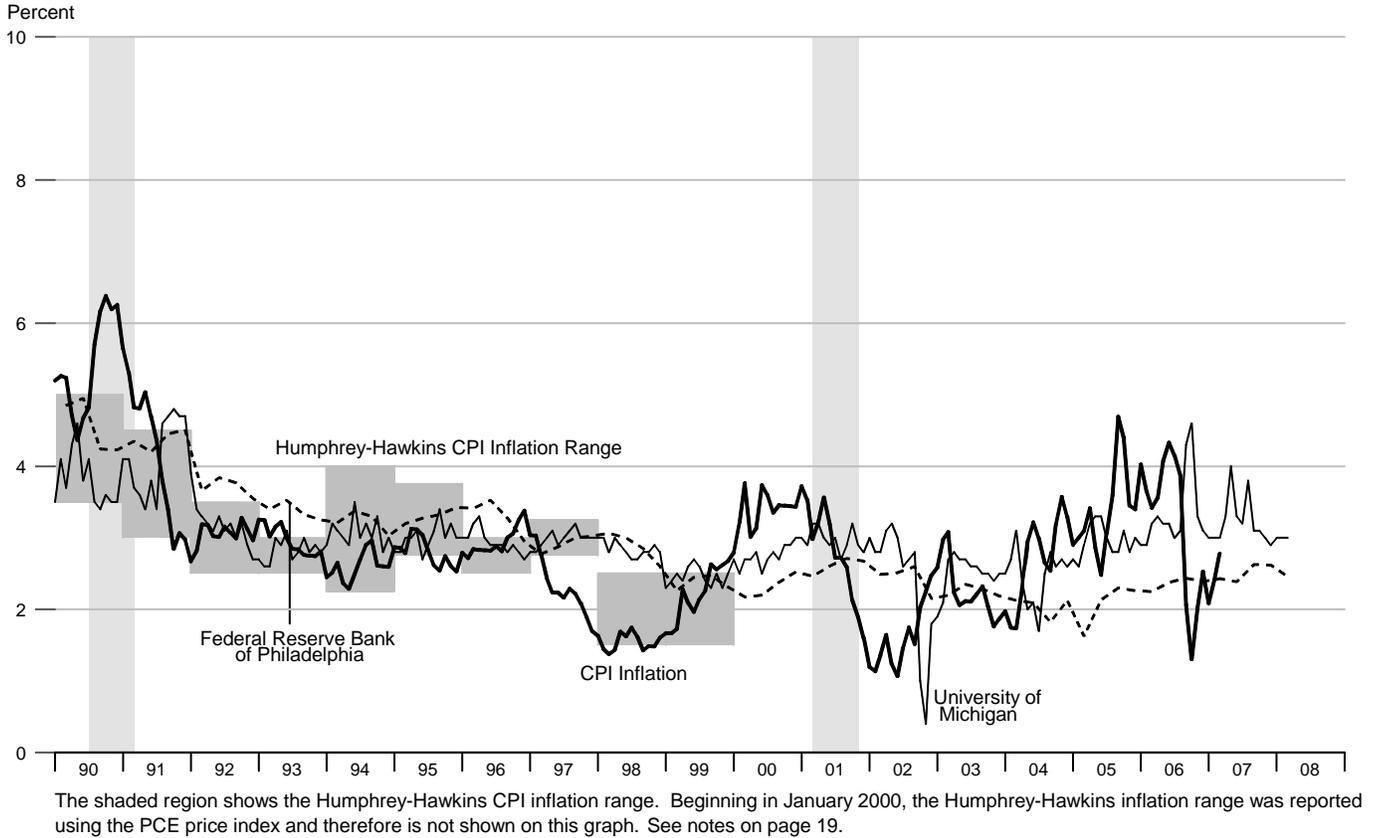


As of April 10, 2006, the Federal Reserve Board made major changes to its commercial paper calculations. For more information, please refer to <http://www.federalreserve.gov/releases/cp/about.htm>.

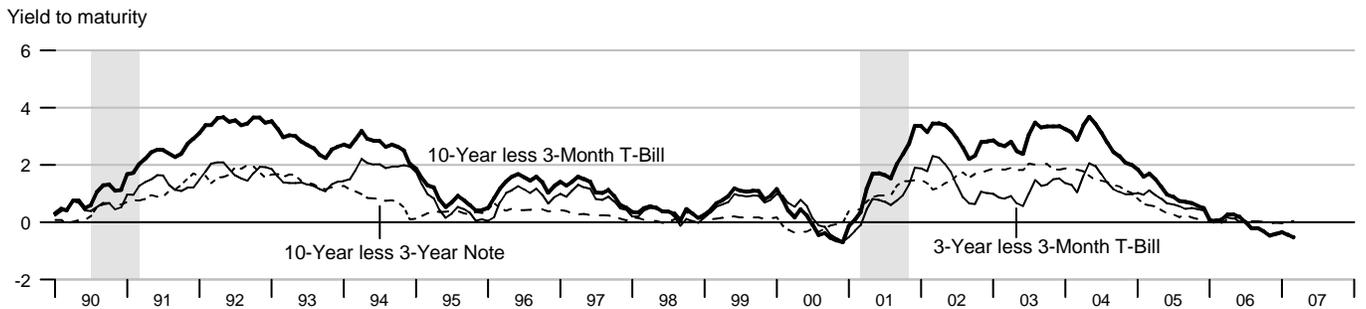
### Consumer Credit



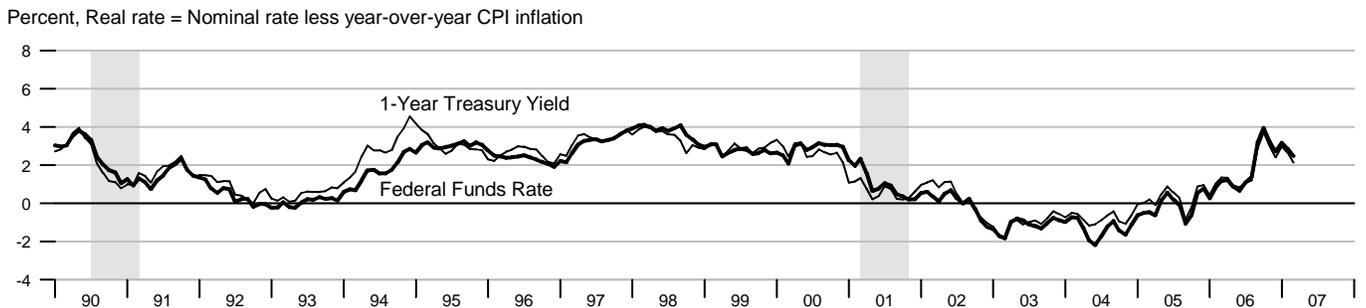
**Inflation and 1-Year-Ahead Inflation Expectations**



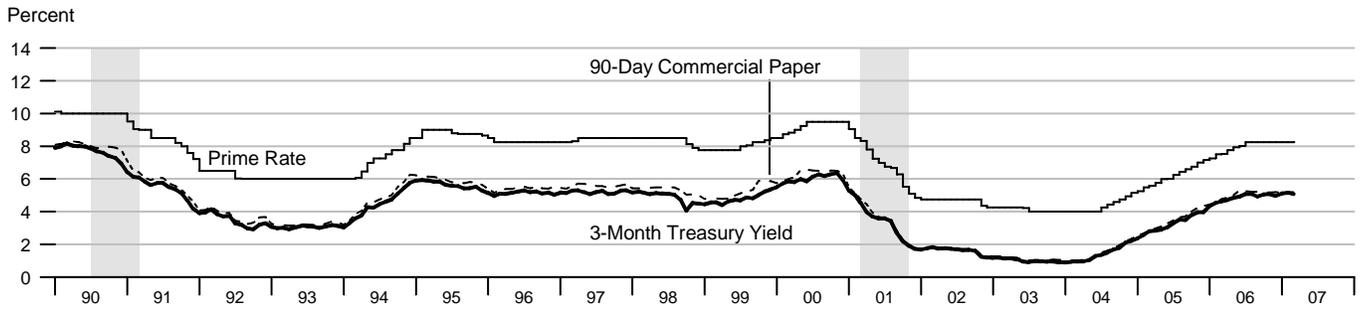
**Treasury Security Yield Spreads**



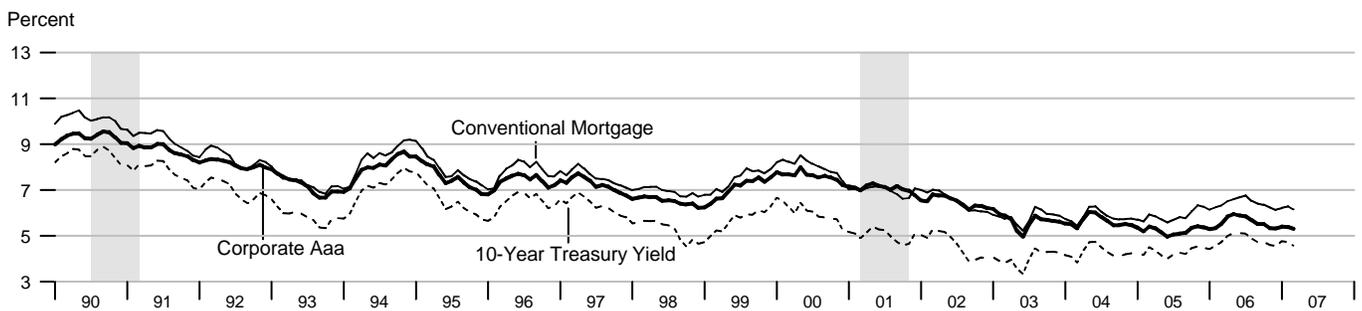
**Real Interest Rates**



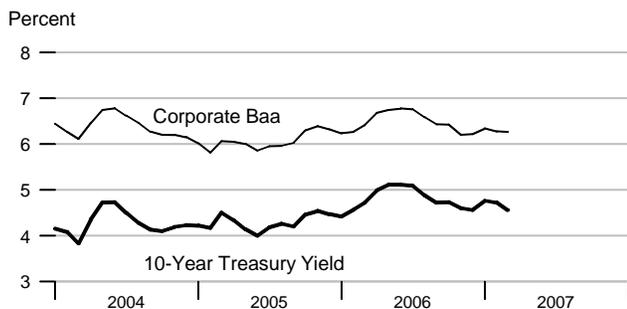
### Short-Term Interest Rates



### Long-Term Interest Rates



### Long-Term Interest Rates

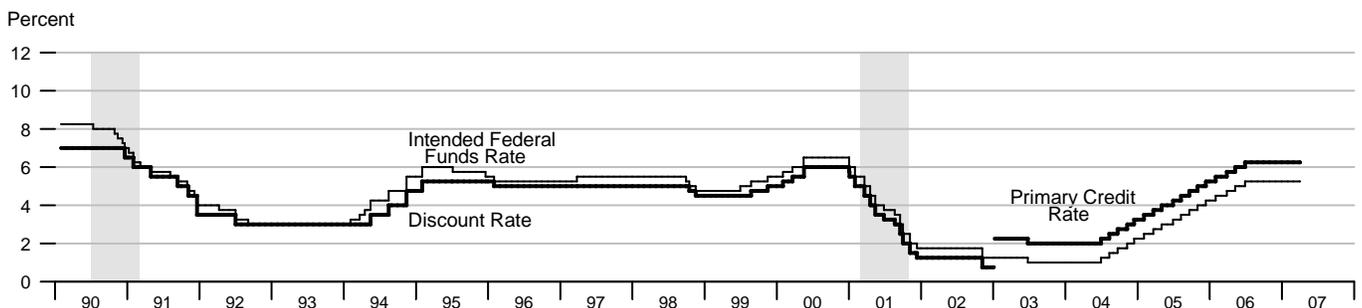


### Short-Term Interest Rates

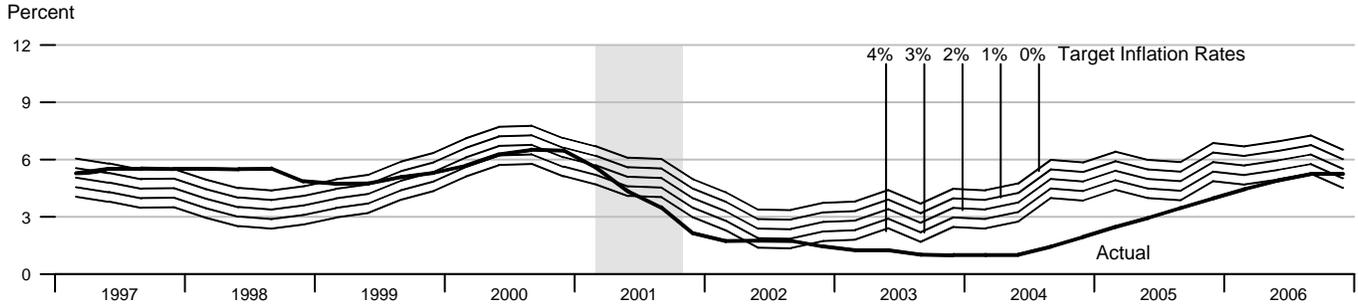


\*90-Day Commercial Paper data are not available for December 2005, January 2006, and July 2006.

### FOMC Intended Federal Funds Rate, Discount Rate, and Primary Credit Rate



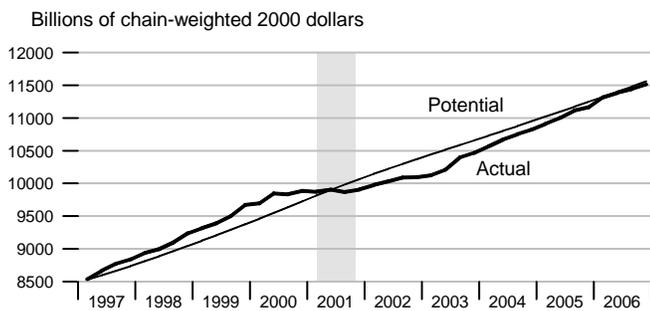
### Federal Funds Rate and Inflation Targets



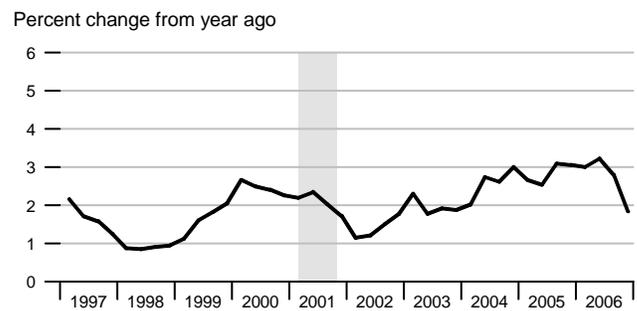
Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

### Components of Taylor's Rule

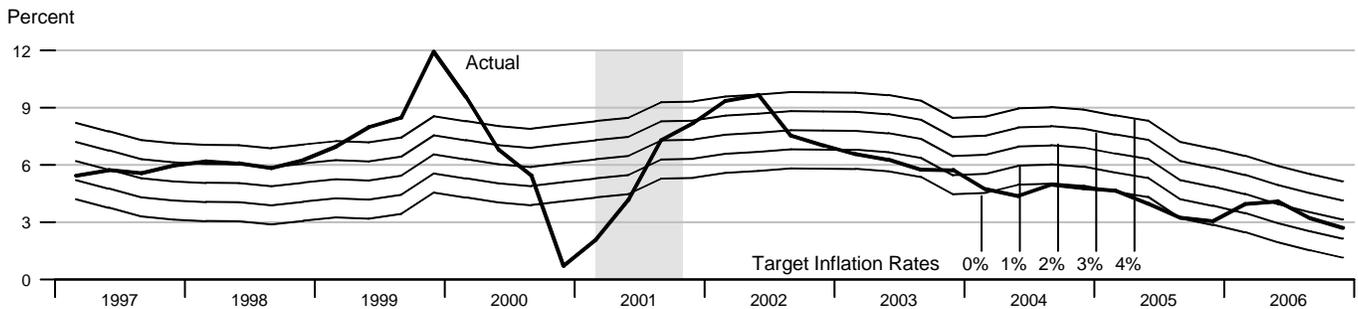
#### Actual and Potential Real GDP



#### PCE Inflation



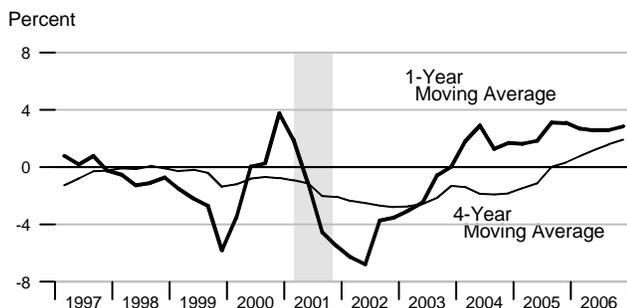
### Monetary Base Growth\* and Inflation Targets



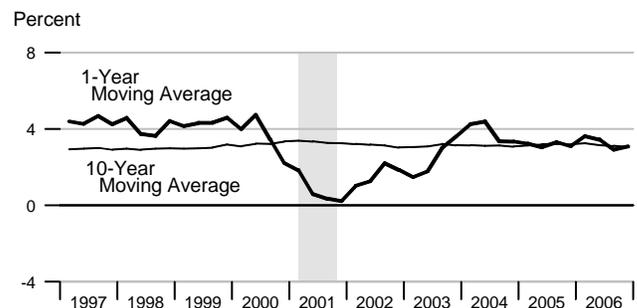
\*Modified for the effects of sweeps programs on reserve demand. Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

### Components of McCallum's Rule

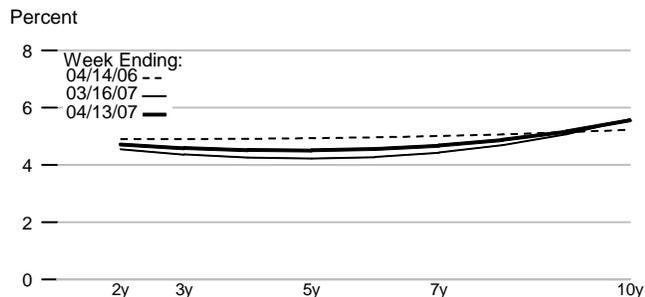
#### Monetary Base Velocity Growth



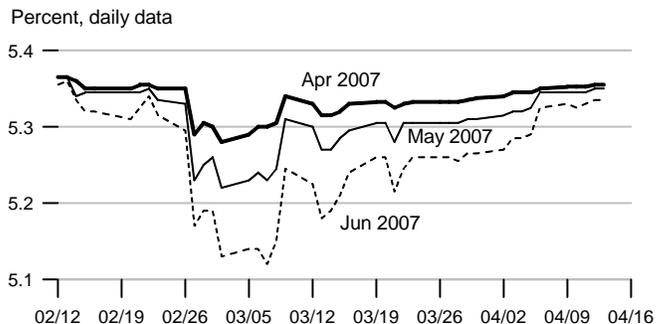
#### Real Output Growth



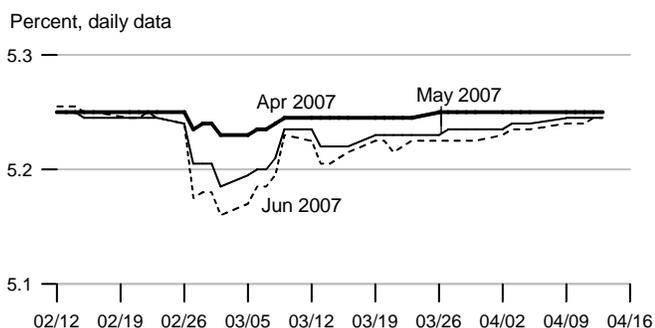
### Implied One-Year Forward Rates



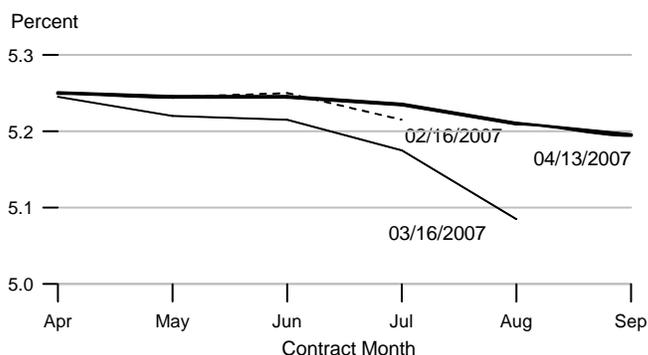
### Rates on 3-Month Eurodollar Futures



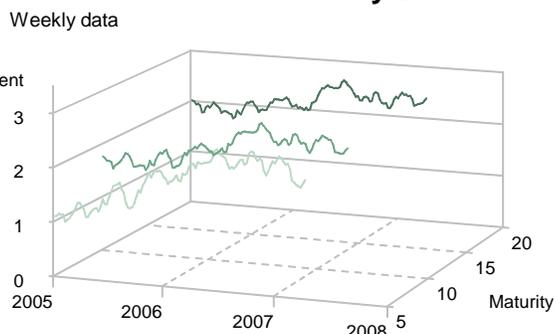
### Rates on Selected Federal Funds Futures Contracts



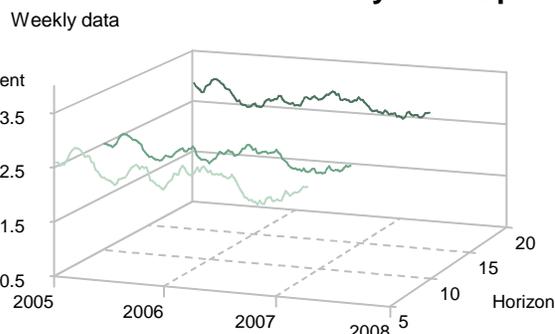
### Rates on Federal Funds Futures on Selected Dates



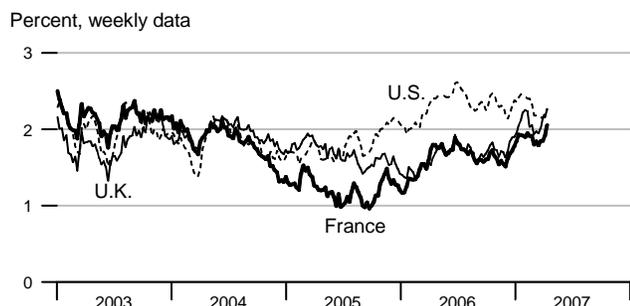
### Inflation-Indexed Treasury Securities



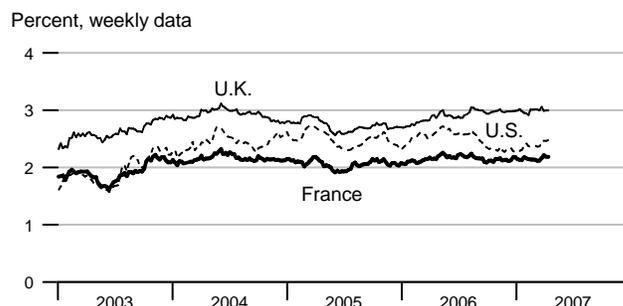
### Inflation-Indexed Treasury Yield Spreads



### Inflation-Indexed 10-Year Government Notes

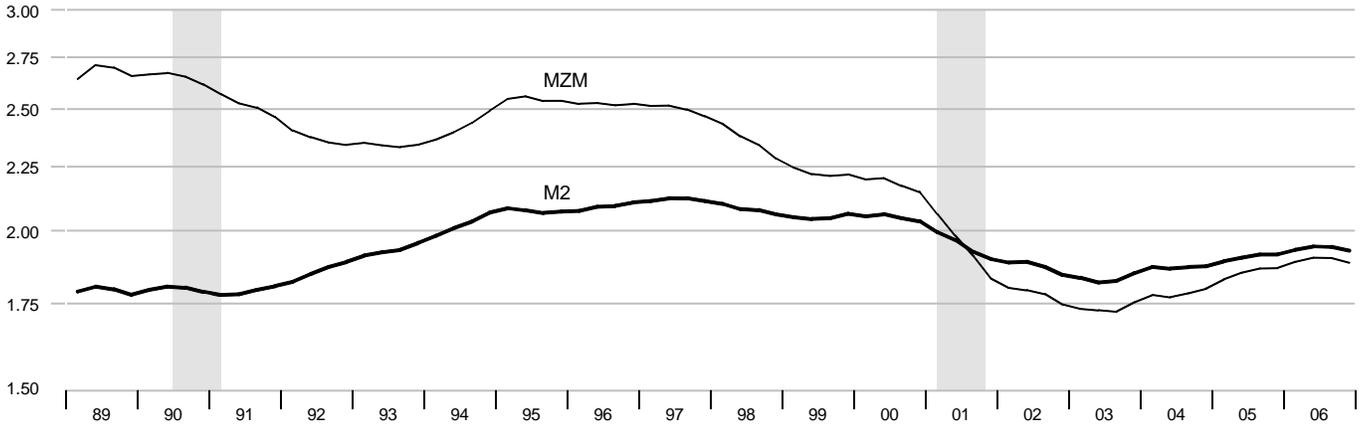


### Inflation-Indexed 10-Year Government Yield Spreads



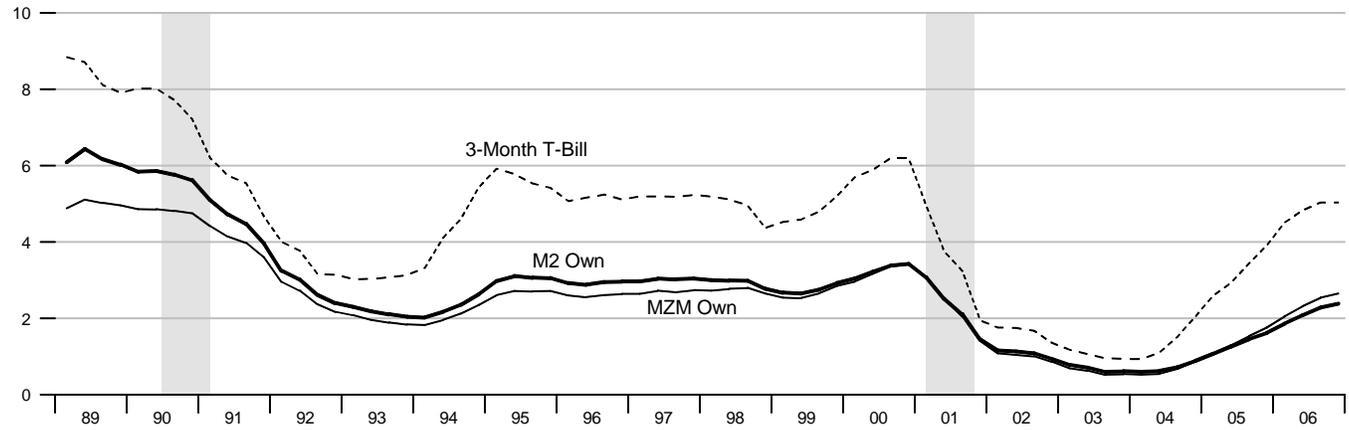
**Velocity**

Nominal GDP/MZM, Nominal GDP/M2 (Ratio Scale)



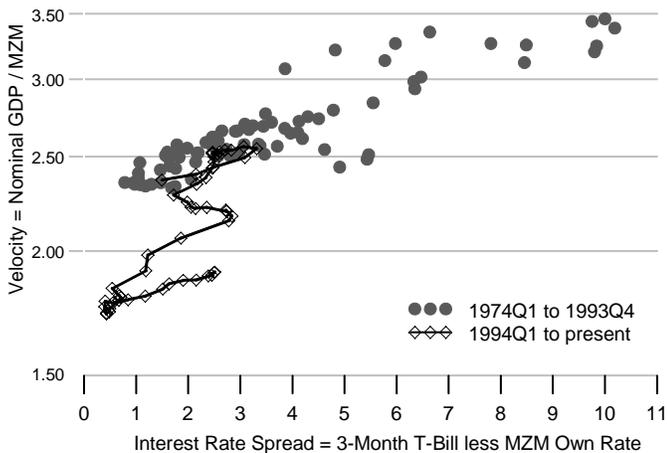
**Interest Rates**

Percent



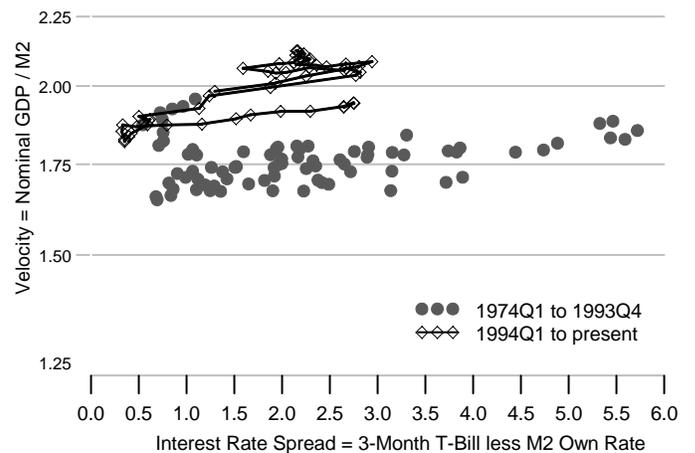
**MZM Velocity and Interest Rate Spread**

Ratio Scale



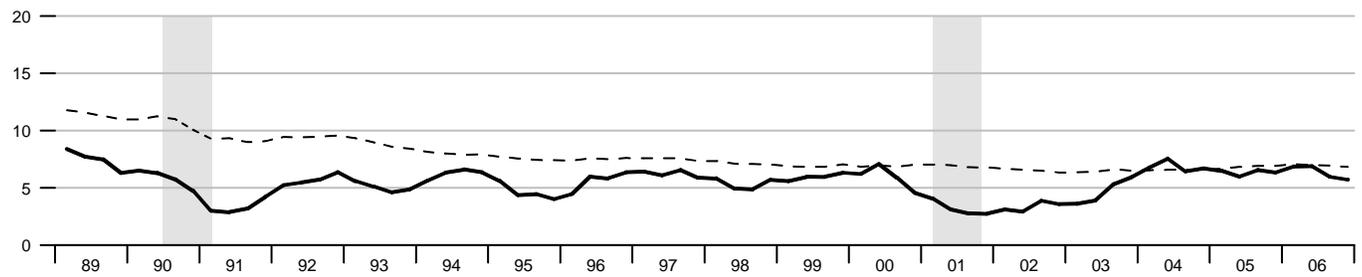
**M2 Velocity and Interest Rate Spread**

Ratio Scale



### Gross Domestic Product

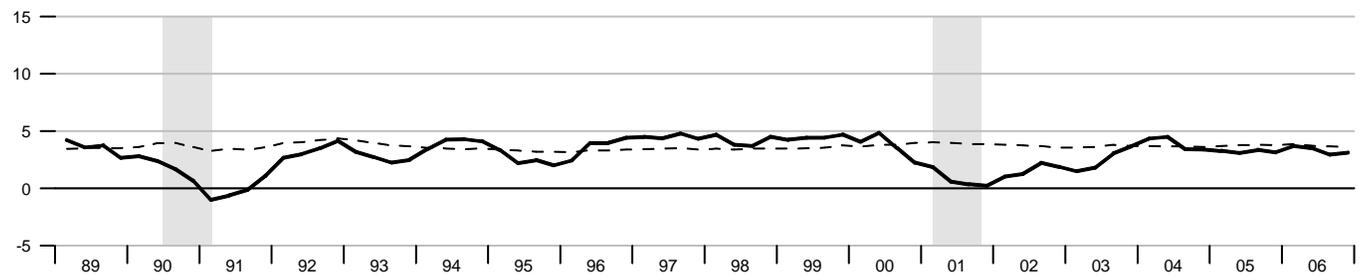
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Real Gross Domestic Product

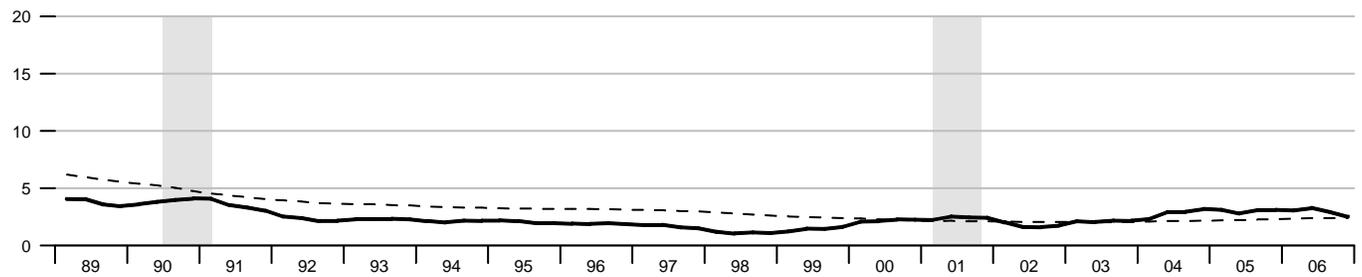
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Gross Domestic Product Price Index

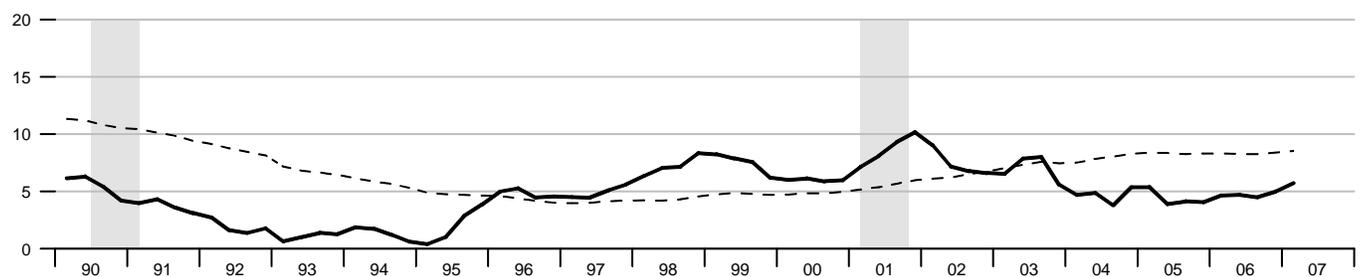
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### M2

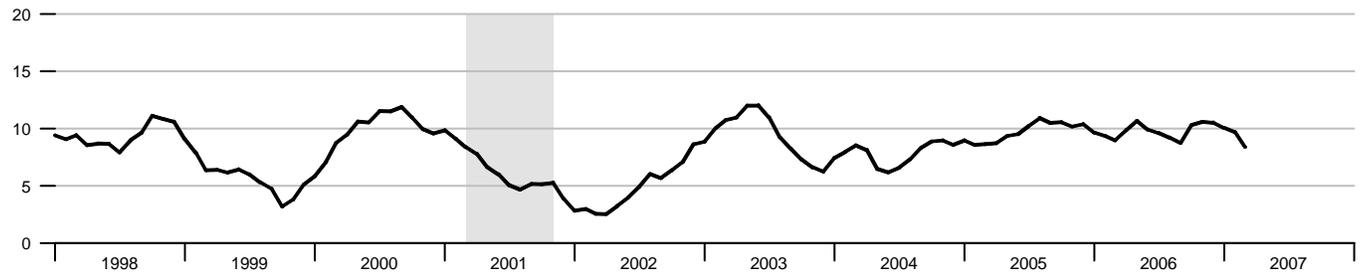
Percent change from year ago



Dashed lines indicate 10-year moving averages.

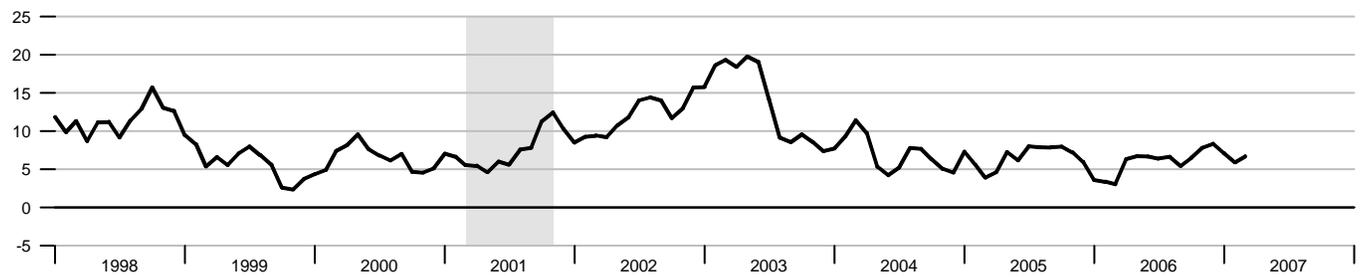
**Bank Credit**

Percent change from year ago



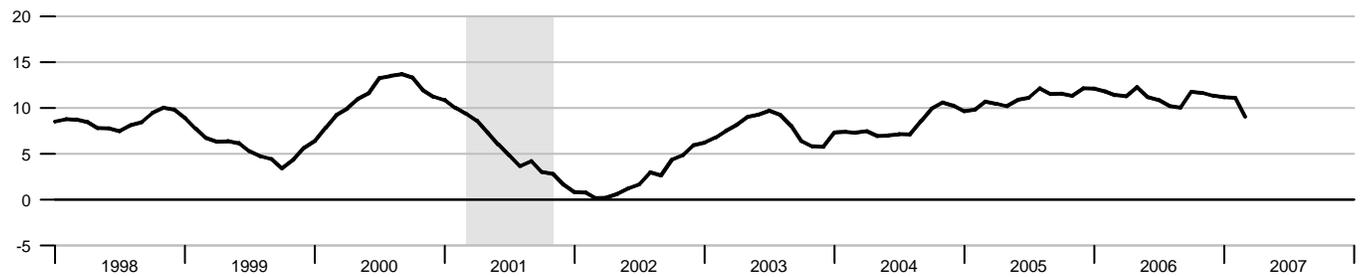
**Investment Securities in Bank Credit at Commercial Banks**

Percent change from year ago



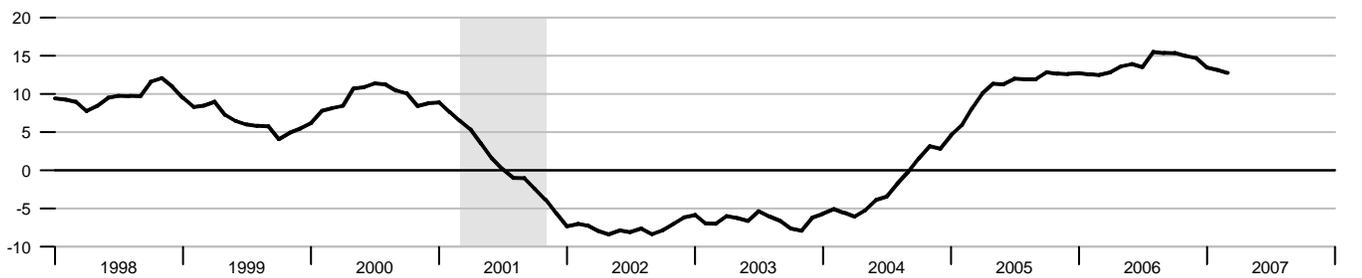
**Total Loans and Leases in Bank Credit at Commercial Banks**

Percent change from year ago

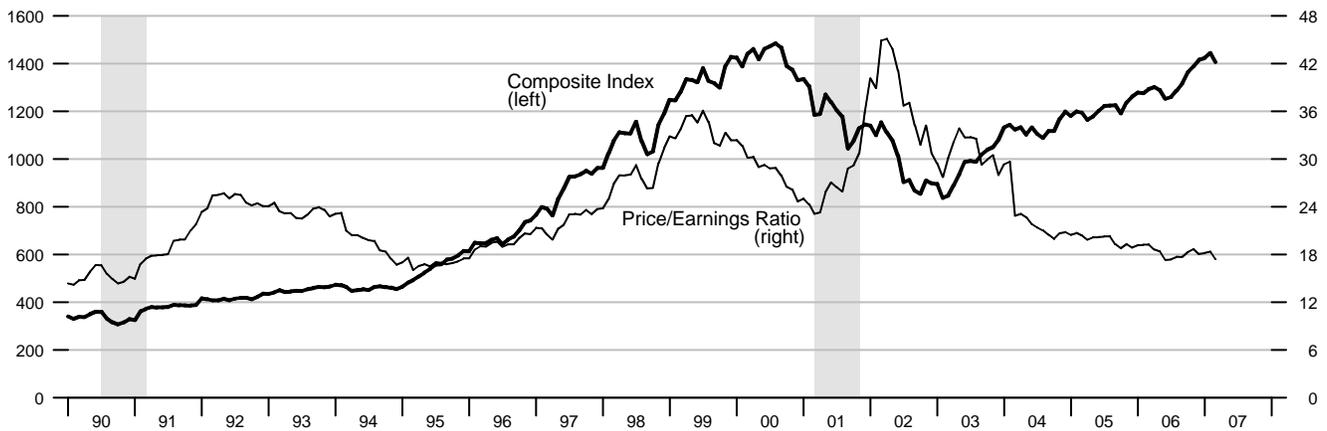


**Commercial and Industrial Loans at Commercial Banks**

Percent change from year ago



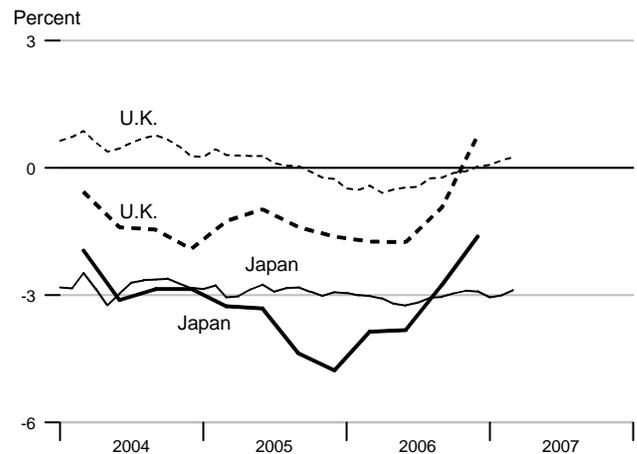
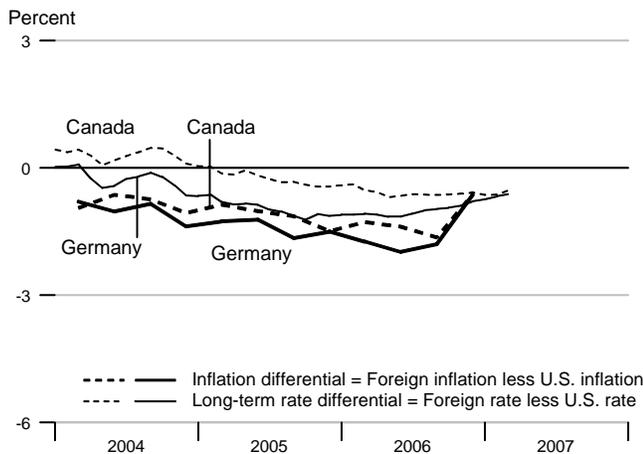
### Standard & Poor's 500



### Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2006Q2	2006Q3	2006Q4	2007Q1	Dec06	Jan07	Feb07	Mar07
United States	3.99	3.36	1.95	2.43	4.56	4.76	4.72	4.56
Canada	2.60	1.72	1.32	.	3.98	4.12	4.09	4.02
France	1.92	1.68	1.34	.	3.81	4.07	4.10	.
Germany	2.01	1.56	1.31	.	3.77	4.02	4.05	3.94
Italy	2.23	2.17	1.82	1.73	4.04	4.26	4.28	4.18
Japan	0.17	0.60	0.33	.	1.65	1.71	1.72	1.68
United Kingdom	2.24	2.43	2.71	.	4.59	4.83	4.90	4.81

### Inflation and Long-Term Interest Rate Differentials



		Money Stock				Bank	Adjusted		MSI M2**
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	
2002		1196.221	5880.427	5590.420	8259.055	5596.906	697.092	88.158	294.080
2003		1273.495	6316.470	5981.398	8787.321	6122.641	740.929	93.313	315.192
2004		1344.523	6570.332	6261.068	9234.718	6598.942	776.711	96.069	329.873
2005		1371.916	6718.081	6533.679	9786.477	7240.591	806.316	96.246	343.539
2006		1374.374	6988.712	6841.510	10270.74	7949.443	835.025	94.858	
2005	1	1368.653	6655.182	6436.460	9528.052	6989.424	798.249	96.658	339.356
	2	1368.816	6666.821	6485.554	9670.405	7160.663	802.653	96.087	341.280
	3	1375.540	6735.907	6566.334	9859.294	7351.708	808.407	96.306	344.766
	4	1374.654	6814.412	6646.370	10088.16	7460.567	815.954	95.932	348.753
2006	1	1379.282	6885.658	6735.457		7641.160	830.498	96.450	
	2	1380.999	6932.477	6790.563		7887.432	836.375	95.067	
	3	1368.836	7002.190	6861.892		8027.570	834.591	94.793	
	4	1368.380	7134.524	6978.127		8241.612	838.634	93.124	
2007	1	1366.264	7288.270	7120.591		8357.860	846.341	94.056	
2005	Mar	1371.600	6658.290	6457.449	9565.346	7081.216	800.907	97.045	340.347
	Apr	1358.047	6659.929	6466.210	9620.909	7106.627	802.318	97.428	340.663
	May	1367.503	6658.588	6481.326	9665.013	7159.385	800.604	94.599	340.941
	Jun	1380.899	6681.947	6509.125	9725.292	7215.977	805.036	96.233	342.235
	Jul	1368.639	6703.395	6532.400	9762.435	7281.867	805.982	95.547	343.275
	Aug	1378.512	6733.756	6566.686	9864.629	7362.388	807.394	95.653	344.739
	Sep	1379.468	6770.569	6599.917	9950.818	7410.868	811.844	97.717	346.285
	Oct	1374.862	6798.996	6625.042	10031.96	7429.864	816.118	97.365	347.590
	Nov	1375.926	6810.169	6644.661	10078.49	7450.153	816.800	96.884	348.603
	Dec	1373.174	6834.070	6669.406	10154.03	7501.685	814.944	93.546	350.067
2006	Jan	1378.910	6876.044	6713.576	10242.79	7558.499	825.252	96.870	353.032
	Feb	1375.180	6884.778	6736.964	10298.68	7647.687	832.441	96.900	353.943
	Mar	1383.756	6896.153	6755.831		7717.293	833.802	95.581	
	Apr	1380.106	6916.075	6774.880		7807.820	835.232	95.498	
	May	1387.342	6927.894	6785.656		7923.686	837.094	94.404	
	Jun	1375.550	6953.461	6811.153		7930.790	836.799	95.298	
	Jul	1371.091	6973.423	6835.761		7981.693	834.952	94.851	
	Aug	1371.531	7002.820	6863.402		8040.768	834.582	94.642	
	Sep	1363.887	7030.326	6886.514		8060.248	834.239	94.885	
	Oct	1369.120	7085.716	6936.274		8195.032	837.860	93.866	
	Nov	1370.445	7127.267	6977.072		8238.847	840.377	94.622	
	Dec	1365.574	7190.590	7021.035		8290.957	837.666	90.883	
2007	Jan	1371.416	7240.217	7081.102		8319.528	843.496	94.015	
	Feb	1359.355	7272.124	7111.975		8388.194	847.318	94.392	
	Mar	1368.020	7352.468	7168.697		8365.857	848.209	93.762	

Note: All values are given in billions of dollars. \*See table of contents for changes to the series.

\*\*We will not update the MSI series until we revise the code to accommodate the discontinuation of M3.

		Federal Funds	Primary Credit Rate	Prime Rate	3-mo CDs	Treasury Yields			Corporate Aaa Bonds	Municipal Aaa Bonds	Conventional Mortgage
						3-mo	3-yr	10-yr			
	2002	1.67		4.68	1.73	1.63	3.10	4.61	6.49	4.87	6.54
	2003	1.13	2.11	4.12	1.15	1.03	2.11	4.02	5.67	4.52	5.82
	2004	1.35	2.34	4.34	1.56	1.40	2.78	4.27	5.63	4.50	5.84
	2005	3.21	4.19	6.19	3.51	3.21	3.93	4.29	5.23	4.28	5.86
	2006	4.96	5.96	7.96	5.15	4.85	4.77	4.79	5.59	4.15	6.41
2005	1	2.47	3.44	5.44	2.78	2.58	3.61	4.30	5.32	4.23	5.76
	2	2.94	3.91	5.91	3.23	2.93	3.73	4.16	5.15	4.15	5.72
	3	3.46	4.43	6.43	3.74	3.43	3.98	4.21	5.09	4.28	5.76
	4	3.98	4.97	6.97	4.30	3.91	4.37	4.49	5.38	4.45	6.22
2006	1	4.46	5.43	7.43	4.72	4.50	4.58	4.57	5.39	4.29	6.24
	2	4.91	5.90	7.90	5.18	4.83	4.98	5.07	5.89	4.36	6.60
	3	5.25	6.25	8.25	5.39	5.03	4.87	4.90	5.68	4.13	6.56
	4	5.25	6.25	8.25	5.32	5.03	4.65	4.63	5.39	3.82	6.24
2007	1	5.26	6.25	8.25	5.31	5.12	4.68	4.68	5.36	3.91	6.22
2005	Mar	2.63	3.58	5.58	2.97	2.80	3.91	4.50	5.40	4.29	5.93
	Apr	2.79	3.75	5.75	3.09	2.84	3.79	4.34	5.33	4.18	5.86
	May	3.00	3.98	5.98	3.22	2.90	3.72	4.14	5.15	4.20	5.72
	Jun	3.04	4.01	6.01	3.38	3.04	3.69	4.00	4.96	4.08	5.58
	Jul	3.26	4.25	6.25	3.57	3.29	3.91	4.18	5.06	4.18	5.70
	Aug	3.50	4.44	6.44	3.77	3.52	4.08	4.26	5.09	4.33	5.82
	Sep	3.62	4.59	6.59	3.87	3.49	3.96	4.20	5.13	4.34	5.77
	Oct	3.78	4.75	6.75	4.13	3.79	4.29	4.46	5.35	4.49	6.07
	Nov	4.00	5.00	7.00	4.31	3.97	4.43	4.54	5.42	4.42	6.33
	Dec	4.16	5.15	7.15	4.45	3.97	4.39	4.47	5.37	4.46	6.27
2006	Jan	4.29	5.26	7.26	4.56	4.34	4.35	4.42	5.29	4.27	6.15
	Feb	4.49	5.50	7.50	4.72	4.54	4.64	4.57	5.35	4.33	6.25
	Mar	4.59	5.53	7.53	4.88	4.63	4.74	4.72	5.53	4.29	6.32
	Apr	4.79	5.75	7.75	5.03	4.72	4.89	4.99	5.84	4.36	6.51
	May	4.94	5.93	7.93	5.15	4.84	4.97	5.11	5.95	4.38	6.60
	Jun	4.99	6.02	8.02	5.35	4.92	5.09	5.11	5.89	4.35	6.68
	Jul	5.24	6.25	8.25	5.46	5.08	5.07	5.09	5.85	4.41	6.76
	Aug	5.25	6.25	8.25	5.38	5.09	4.85	4.88	5.68	4.10	6.52
	Sep	5.25	6.25	8.25	5.34	4.93	4.69	4.72	5.51	3.87	6.40
	Oct	5.25	6.25	8.25	5.33	5.05	4.72	4.73	5.51	3.91	6.36
	Nov	5.25	6.25	8.25	5.32	5.07	4.64	4.60	5.33	3.81	6.24
	Dec	5.24	6.25	8.25	5.32	4.97	4.58	4.56	5.32	3.76	6.14
2007	Jan	5.25	6.25	8.25	5.32	5.11	4.79	4.76	5.40	3.89	6.22
	Feb	5.26	6.25	8.25	5.31	5.16	4.75	4.72	5.39	3.95	6.29
	Mar	5.26	6.25	8.25	5.30	5.08	4.51	4.56	5.30	3.88	6.16

Note: All values are given as a percent at an annual rate.

		M1	MZM	M2	M3*
<b>Percent change at an annual rate</b>					
2002		4.91	12.76	7.38	7.98
2003		6.46	7.42	6.99	6.40
2004		5.58	4.02	4.68	5.09
2005		2.04	2.25	4.35	5.97
2006		0.18	4.03	4.71	4.95
<hr/>					
2005	1	-0.58	0.06	3.08	5.63
	2	0.05	0.70	3.05	5.98
	3	1.96	4.15	4.98	7.81
	4	-0.26	4.66	4.88	9.29
2006	1	1.35	4.18	5.36	
	2	0.50	2.72	3.27	
	3	-3.52	4.02	4.20	
	4	-0.13	7.56	6.78	
2007	1	-0.62	8.62	8.17	
<hr/>					
2005	Mar	2.39	0.52	3.84	4.25
	Apr	-11.86	0.30	1.63	6.97
	May	8.36	-0.24	2.81	5.50
	Jun	11.76	4.21	5.15	7.48
	Jul	-10.65	3.85	4.29	4.58
	Aug	8.66	5.44	6.30	12.56
	Sep	0.83	6.56	6.07	10.48
	Oct	-4.01	5.04	4.57	9.79
	Nov	0.93	1.97	3.55	5.57
	Dec	-2.40	4.21	4.47	8.99
2006	Jan	5.01	7.37	7.95	10.49
	Feb	-3.25	1.52	4.18	6.55
	Mar	7.48	1.98	3.36	
	Apr	-3.17	3.47	3.38	
	May	6.29	2.05	1.91	
	Jun	-10.20	4.43	4.51	
	Jul	-3.89	3.44	4.34	
	Aug	0.39	5.06	4.85	
	Sep	-6.69	4.71	4.04	
	Oct	4.60	9.45	8.67	
	Nov	1.16	7.04	7.06	
	Dec	-4.27	10.66	7.56	
2007	Jan	5.13	8.28	10.27	
	Feb	-10.55	5.29	5.23	
	Mar	7.65	13.26	9.57	

\*See table of contents for changes to the series.

## Definitions

**M1:** The sum of currency held outside the vaults of depository institutions, Federal Reserve Banks, and the U.S. Treasury; travelers checks; and demand and other checkable deposits issued by financial institutions (except demand deposits due to the Treasury and depository institutions), minus cash items in process of collection and Federal Reserve float.

**MZM (money, zero maturity):** M2 minus small-denomination time deposits, plus institutional money market mutual funds (that is, those included in M3 but excluded from M2). The label MZM was coined by William Poole (1991); the aggregate itself was proposed earlier by Motley (1988).

**M2:** M1 plus savings deposits (including money market deposit accounts) and small-denomination (under \$100,000) time deposits issued by financial institutions; and shares in retail money market mutual funds (funds with initial investments under \$50,000), net of retirement accounts.

**M3:** M2 plus large-denomination (\$100,000 or more) time deposits; repurchase agreements issued by depository institutions; Eurodollar deposits, specifically, dollar-denominated deposits due to nonbank U.S. addresses held at foreign offices of U.S. banks worldwide and all banking offices in Canada and the United Kingdom; and institutional money market mutual funds (funds with initial investments of \$50,000 or more).

**Bank Credit:** All loans, leases, and securities held by commercial banks.

**Domestic Nonfinancial Debt:** Total credit market liabilities of the U.S. Treasury, federally sponsored agencies, state and local governments, households, and nonfinancial firms. End-of-period basis.

**Adjusted Monetary Base:** The sum of currency in circulation outside Federal Reserve Banks and the U.S. Treasury, deposits of depository financial institutions at Federal Reserve Banks, and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This series is a spliced chain index; see Anderson and Rasche (1996a,b, 2001, 2003).

**Adjusted Reserves:** The sum of vault cash and Federal Reserve Bank deposits held by depository institutions and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This spliced chain index is numerically larger than the Board of Governors' measure, which excludes vault cash not used to satisfy statutory reserve requirements and Federal Reserve Bank deposits used to satisfy required clearing balance contracts; see Anderson and Rasche (1996a, 2001, 2003).

**Monetary Services Index:** An index that measures the flow of monetary services received by households and firms from their holdings of liquid assets; see Anderson, Jones, and Nesmith (1997). Indexes are shown for the assets included in M2, with additional data at [research.stlouisfed.org/msi/index.html](http://research.stlouisfed.org/msi/index.html).

**Note:** M1, M2, M3, Bank Credit, and Domestic Nonfinancial Debt are constructed and published by the Board of Governors of the Federal Reserve System. For details, see *Statistical Supplement to the Federal Reserve Bulletin*, tables 1.21 and 1.26. MZM, Adjusted Monetary Base, Adjusted Reserves, and Monetary Services Index are constructed and published by the Research Division of the Federal Reserve Bank of St. Louis.

## Notes

**Page 3:** Readers are cautioned that, since early 1994, the level and growth of M1 have been depressed by retail sweep programs that reclassify transactions deposits (demand deposits and other checkable deposits) as savings deposits overnight, thereby reducing banks' required reserves; see Anderson and Rasche (2001) and [research.stlouisfed.org/aggreg/swdata.html](http://research.stlouisfed.org/aggreg/swdata.html). **Primary Credit Rate**, **Discount Rate**, and **Intended Federal Funds Rate** shown in the chart **Reserve Market Rates** are plotted as of the date of the change, while the **Effective Federal Funds Rate** is plotted as of the end of the month. Interest rates in the table are monthly averages from the Board of Governors H.15 Statistical Release. The **Treasury Yield Curve** and **Real Treasury Yield Curve** show constant maturity yields calculated by the U.S. Treasury for securities 5, 7, 10, and 20 years to maturity. **Inflation-Indexed Treasury Yield Spreads** are a

measure of inflation compensation at those horizons, and it is simply the nominal constant maturity yield less the real constant maturity yield. Daily data and descriptions are available at [research.stlouisfed.org/fred2/](http://research.stlouisfed.org/fred2/). See also *Statistical Supplement to the Federal Reserve Bulletin*, table 1.35. The 30-year constant maturity series was discontinued by the Treasury as of February 18, 2002.

**Page 5:** **Checkable Deposits** is the sum of demand and other checkable deposits. **Savings Deposits** is the sum of money market deposit accounts and passbook and statement savings. **Time Deposits** have a minimum initial maturity of 7 days. **Large Time Deposits** are deposits of \$100,000 or more. **Retail and Institutional Money Market Mutual Funds** are as included in M2 and the non-M2 component of M3, respectively.

**Page 7:** **Excess Reserves plus RCB (Required Clearing Balance) Contracts** equals the amount of deposits at Federal Reserve Banks held by depository institutions but not applied to satisfy statutory reserve requirements. (This measure excludes the vault cash held by depository institutions that is not applied to satisfy statutory reserve requirements.) **Consumer Credit** includes most short- and intermediate-term credit extended to individuals. See *Statistical Supplement to the Federal Reserve Bulletin*, table 1.55.

**Page 8:** **Inflation Expectations** measures include the quarterly Federal Reserve Bank of Philadelphia *Survey of Professional Forecasters*, the monthly University of Michigan Survey Research Center's *Surveys of Consumers*, and the annual Federal Open Market Committee (FOMC) range as reported to the Congress in the February testimony that accompanies the Monetary Policy Report to the Congress. Beginning February 2000, the FOMC began using the personal consumption expenditures (PCE) price index to report its inflation range; the FOMC then switched to the PCE chain-type price index excluding food and energy prices ("core") beginning July 2004. Accordingly, neither are shown on this graph. **CPI Inflation** is the percentage change from a year ago in the consumer price index for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus year-over-year CPI inflation.

**Page 9:** **FOMC Intended Federal Funds Rate** is the level (or midpoint of the range, if applicable) of the federal funds rate that the staff of the FOMC expected to be consistent with the desired degree of pressure on bank reserve positions. In recent years, the FOMC has set an explicit target for the federal funds rate.

**Page 10:** **Federal Funds Rate and Inflation Targets** shows the observed federal funds rate, quarterly, and the level of the funds rate implied by applying Taylor's (1993) equation

$$f_t^* = 2.5 + \pi_{t-1} + (\pi_{t-1} - \pi^*)/2 + 100 \times (y_{t-1} - y_{t-1}^P)/2$$

to five alternative target inflation rates,  $\pi^* = 0, 1, 2, 3, 4$  percent, where  $f_t^*$  is the implied federal funds rate,  $\pi_{t-1}$  is the previous period's inflation rate (PCE) measured on a year-over-year basis,  $y_{t-1}$  is the log of the previous period's level of real gross domestic product (GDP), and  $y_{t-1}^P$  is the log of an estimate of the previous period's level of potential output. **Potential Real GDP** is as estimated by the Congressional Budget Office.

**Monetary Base Growth and Inflation Targets** shows the quarterly growth of the adjusted monetary base (modified to include an estimate of the effect of sweep programs) implied by applying McCallum's (1988, 1993) equation

$$\Delta MB_t^* = \pi^* + (10\text{-year moving average growth of real GDP}) - (4\text{-year moving average of base velocity growth})$$

to five alternative target inflation rates,  $\pi^* = 0, 1, 2, 3, 4$  percent, where  $\Delta MB_t^*$  is the implied growth rate of the adjusted monetary base. The 10-year moving average growth of real GDP for a quarter  $t$  is calculated as the average quarterly growth during the previous 40 quarters, at an annual rate, by the formula  $((y_t - y_{t-40})/40) \times 400$ , where  $y_t$  is the log of real GDP. The 4-year moving average of base velocity growth is calculated similarly. To adjust the monetary base for the effect of retail-deposit sweep programs, we add to the monetary base an amount equal to 10 percent of the total amount swept, as estimated by the Federal Reserve Board staff. These estimates are imprecise, at best. Sweep program data are found at [research.stlouisfed.org/aggreg/swdata.html](http://research.stlouisfed.org/aggreg/swdata.html).

Page 11: **Implied One-Year Forward Rates** are calculated by this Bank from Treasury constant maturity yields. Yields to maturity,  $R(m)$ , for securities with  $m = 1, \dots, 10$  years to maturity are obtained by linear interpolation between reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

$$R(m) = a_0 + (a_1 + a_2)(1 - e^{-m/50})/(m/50) - a_2 \times e^{-m/50},$$

and forward rates are calculated from these smoothed yields using equation (a) in table 13.1 of Shiller (1990),

$$f(m) = [D(m)R(m) - D(m-1)] / [D(m) - D(m-1)],$$

where duration is approximated as  $D(m) = (1 - e^{-R(m) \times m})/R(m)$ . These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures and Rates on Selected Federal Funds Futures Contracts** trace through time the yield on three specific contracts. **Rates on Federal Funds Futures on Selected Dates** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Indexed Treasury Securities and Yield Spreads** are those plotted on page 3. **Inflation-Indexed 10-Year Government Notes** shows the yield of an inflation-indexed note that is scheduled to mature in approximately (but not greater than) 10 years. The current French note has a maturity date of 7/25/2015, the current U.K. note has a maturity date of 8/16/2013, and the current U.S. note has a maturity date of 1/15/2017. **Inflation-Indexed Treasury Yield Spreads** and **Inflation-Indexed 10-Year Government Yield Spreads** equal the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted security yields of similar maturity.

Page 12: **Velocity** (for MZM and M2) equals the ratio of GDP, measured in current dollars, to the level of the monetary aggregate. **MZM** and **M2 Own Rates** are weighted averages of the rates received by households and firms on the assets included in the aggregates. Prior to 1982, the 3-month T-bill rates are secondary market yields. From 1982 forward, rates are 3-month constant maturity yields.

Page 13: **Real Gross Domestic Product** is GDP as measured in chained 2000 dollars. The **Gross Domestic Product Price Index** is the implicit price deflator for GDP, which is defined by the Bureau of Economic Analysis, U.S. Department of Commerce, as the ratio of GDP measured in current dollars to GDP measured in chained 2000 dollars.

Page 14: **Investment Securities** are all securities held by commercial banks in both investment and trading accounts.

Page 15: **Inflation Rate Differentials** are the differences between the foreign consumer price inflation rates and year-over-year changes in the U.S. all-items Consumer Price Index.

Page 17: **Treasury Yields** are Treasury constant maturities as reported in the Board of Governors of the Federal Reserve System's H.15 release.

## Sources

Agence France Trésor: French note yields.

Bank of Canada: Canadian note yields.

Bank of England: U.K. note yields.

Board of Governors of the Federal Reserve System:

Monetary aggregates and components: H.6 release. Bank credit and components: H.8 release. Consumer credit: G.19 release. Required reserves, excess reserves, clearing balance contracts, and discount window borrowing: H.4.1 and H.3 releases. Interest rates: H.15 release. Nonfinancial commercial paper: Board of Governors website. Nonfinancial debt: Z.1 release. M2 own rate.

Bureau of Economic Analysis: GDP.

Bureau of Labor Statistics: CPI.

Chicago Board of Trade: Federal funds futures contract.

Chicago Mercantile Exchange: Eurodollar futures.

Congressional Budget Office: Potential real GDP.

Federal Reserve Bank of Philadelphia: Survey of Professional Forecasters inflation expectations.

Federal Reserve Bank of St. Louis: Adjusted monetary base and adjusted reserves, monetary services index, MZM own rate, one-year forward rates.

Organization for Economic Cooperation and Development: International interest and inflation rates.

Standard & Poor's: Stock price-earnings ratio, stock price composite index.

University of Michigan Survey Research Center: Median expected price change.

U.S. Department of the Treasury: U.S. security yields.

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**Note:** \*Available on the Internet at [research.stlouisfed.org/publications/review/](http://research.stlouisfed.org/publications/review/).